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Work by D.E. Pritchard and his collaborators is summarized here.

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PROGRESS REPORT FOR OFFICE OF NAVAL RESEARCH

TRAPS FOR NEUTRAL ATOMS

D. E. Pritchard, et al

N00014-83-K-0695

This past year, we have concentrated on radio frequency resonance experiments on magnetically trapped neutral atoms. (We are the only group in the world which has done such experiments.) r.f. resonance of trapped atoms is valuable for at least three reasons: as a high resolution diagnostic of the atoms' individual and collective behavior, as a tool to selectively manipulate the magnetic quantum states of the trapped atoms, and potentially for ultra-high resolution spectroscopy of isolated atomic systems.

Following the successful demonstration of r.f. induced transitions on trapped neutral atoms [1], we proceeded to increase the number ($\sim 2 \times 10^{10}$) and confinement time ($\tau_{1/e} = 30$ minutes) of trapped Na atoms so that we had sufficient signal to time to perform r.f. resonance measurements as a diagnostic of the effects of doppler cooling on the atoms' energy distribution.

An r.f. resonance curve for the $|F=2, M=2\rangle$ to $|F=2, M=1\rangle$ hyperfine transition was obtained by measuring the relative peak heights of the fluorescence spectrum for the two states as a function of the frequency of the applied r.f. r.f. resonance curve for "hot" atoms (after initial loading of the trap) were much wider than that of "cool" atoms after application of longitudinal doppler cooling. We found that doppler cooling of the sample required a very weak standing wave laser beam to avoid excess heating of the transverse degree of freedom.

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